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ABSTRACT

The workshop paper examines the use of microcomputer packages to analyze spontaneous language samples of children with communication disorders. Advantages of computerized analysis are seen to include time saving, more efficient data management, and increased objectivity. To help consumers determine which programs to buy, four aspects are discussed: types of needed information, current information being obtained, type of available computer hardware, and backgrounds and attitudes of personnel involved. Language analysis software is then examined in terms of capabilities, time, user friendliness, cost, and local application. Three software packages for language analysis are examined: Lingquest 1, PANEL, and SALT. Advantages, limitations, and possible applications of each program are explored. (CL)

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# Microcomputer Analysis of Children's Language Samples

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Microcomputer Analysis of Children's Language Samples

Microcomputers are changing the accuracy and efficiency with which we organize our lives. This includes our professional lives. Schwartz (1984) lists five broad areas where microcomputers have begun to affect the professional lives of those who work with communication disorders. In each of these areas the use of appropriate software packages can allow our work to be done better and faster. The five areas include (1) maintaining client schedules and IEPs, (2) analyzing diagnostic test performance, (3) using word processing capabilities to generate reports, (4) presenting language concepts during the instructional or therapeutic session, and (5) providing arrays of communication devices for the severely impaired. Lengthy books have been written about each one of these areas, and our topic today is much narrower. Let me say in passing, however, that it will be important for every communications specialist to become generally informed about progress in microcomputer applications in these five areas and also to know sources of further information when we have particular needs. University training programs are incorporating microcomputer laboratories and courses into their training sequences for new professionals. Those who have been in the field for awhile also need to be aware of the changes

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that are underway.

This workshop paper deals with one aspect of using microcomputer packages to analyze diagnostic test performance. We will focus on a specific area of evaluation, namely the use of microcomputer packages to analyze spontaneous language samples.

This workshop grew out of a series of meetings which occurred last spring at the University of Kansas under the sponsorship of the Child Language Program and the Department of Speech-Language-Hearing Sciences and Disorders. A group of faculty members and graduate students from various departments met weekly to explore and evaluate microcomputer packages useful for language sample analysis. We were interested in determining their usefulness for answering both clinical and research questions. Dr. Mabel Rice chaired the group. Experts in child language who were visiting the Lawrence campus, such as Catherine Snow and Melissa Bowerman, met with our group and shared their reactions. As the semester progressed, Dr. Rice received numerous requests from school districts, clinics, and fellow researchers for help in determining the usefulness of the three programs under discussion today.

Probably the first question to be answered is why bother to analyze language samples with a microcomputer?

One answer may be time savings. Numerous experts (Bloom & Lahey, 1978; Miller, 1981) have helped us to realize how a detailed analysis of a child's spontaneous language sample contributes essential information to assessment. There are several aspects of communication, verbal and nonverbal, which cannot be assessed in any other way. Yet getting useful information from a language sample takes a great amount of time--40 hours is frequently mentioned as a typical time requirement for a thorough analysis. First a representative sample must be obtained; this is often not an easy task with young developmentally delayed children. Then the notes or tape must be transcribed into written form suitable for analysis. Next the analysis itself must be done, with as much depth as is suitable for present purposes. Finally, the results of the analysis must be tabulated and compared with whatever normative data we can find for that particular skill. We often take shortcuts and omit useful analyses just because there is not enough time to do a full analysis. School clinicians tend to take language samples only one or two times a year and then from only some of the children, because analyzing the samples takes so much time. Child language researchers have tended to use very small numbers of children in their studies because analyzing the language samples of more children quickly

becomes overwhelming. And then, of course, we are left wondering how representative of the general population are the children studied by Dr. X or Dr. Y. Whether we are concerned with clinic, classroom, or research setting, if microcomputer programs allow us to perform better and more frequent language analyses in the same amount of time as manual analyses, then they are worth using.

However, none of the programs now available is automatic. The user must code some aspects of each utterance before the computer can analyze it. Given the intricacies of the English language, perhaps some manual coding of transcripts will always be necessary. However, computer programs vary in the amount and the type of manual coding they require; this makes it necessary to calculate the time saving, or lack of it, on a program by program and a case by case basis.

Other advantages of computerized analysis concern management of the data set. When a computer program is used, the printout is consistent across subjects, across time, and even across different personnel who enter different language samples. It is a simple matter to make multiple copies of the transcript and the analyses. Numerous samples can be stored on floppy disks and accessed readily whenever they are needed. "Before intervention" and "after intervention" examples are easy

to obtain. An advantage for researchers is that old data files can be called up and reanalyzed with new techniques as new questions arise. Lengthy transcripts can also be easily reduced for statistical analysis; for example, comprehensive data from a one-hour transcript may be summarized on half a page.

Computerized language analysis may have one more advantage, and that has to do with the objectivity of the analysis. Software packages vary tremendously in the amount of machine grading of language categories they provide. When a program has extensive machine grading, then it has rules for each language category, and the same word in the same location in a sentence will always be graded into the same category, regardless of the person who performs the programmed analysis. This automatic reliability may be very useful and may save money in research settings.

How do I know which program to buy? is the next likely question. To answer it, you need to back up and answer several other questions first. It is essential to evaluate first your own situation, the situation in which a microcomputer program will potentially be used.

Ask: (1) What kinds of information do I wish the language sample analysis to provide? A large variety of syntactic, semantic, and pragmatic variables might be of

interest in your setting. One, two or more speakers might be followed. Nonverbal as well as verbal data may be important. Your needs may be constant, or they may be likely to change from client to client and from year to year. Generally programs with more flexibility require the program user to do more and the machine to do less than programs whose purpose is more limited. This may require more training time for program users. Thus the trade-off for more flexibility may be more complexity for the user. Be as precise as you can about your needs in language sample analysis. This will help to insure that the program you purchase will satisfy your needs.

(2) Next ask: Which of the kinds of information that I desire am I presently getting, and what are the costs of obtaining that information at present? How often are you currently taking language samples? Of what length are they? What types of analysis are being performed on the samples, and by whom? How much of the analysis is being done by a professional at present, and how much by a clerk? How many human hours typically go into a language sample analysis? What types of information that you need from language samples are you presently not getting, and what are the costs of this?

(3) Next ask: What type of computer hardware is available for my use? The amount of time it is

available for your use should also be evaluated. Of course, this question can be omitted if you have funds available to buy new computer hardware as needed for whatever software you purchase. The three software packages that I will describe today all run on Apple IIe microcomputers; two are presently available for IBM micros and the third soon will be. Entirely different packages need to be purchased for different computers.

(4) Finally, ask: What are the backgrounds and attitudes of personnel who will be using a software package I purchase? If you alone are to be the user, then you alone will need to be satisfied, and the complexity and characteristics of the program can be matched to your own wishes. If, however, a number of people will be using the program, it is important to detereine their previous experience with microcomputers, their attitudes toward learning to use them, and their history of mastering new techniques. It is valuable to determine how much time for training these persons will have and whether time and funds for training them are available. Answering these questions is important because the best computer program will be without value if it isn't used.

Once you have clarified your own situation, you are ready to look at particular software packages. What

can various programs do? Again, this question is best broken into parts. The next five minutes of this workshop are the nuts and bolts of analyzing any language analysis software that will appear in the foreseeable future. Purchasing a computer program should not be an emotional action, or an impulsive one, or even a statement of "with-it-ness." It should be a rational step, taken after answering a host of questions about several aspects of the program.

The first area to consider is capabilities. What types of analysis can the program do--for example, syntax, semantics, pragmatics, or some combination of these. What linguistic developmental level or levels can it evaluate--for example, children at the one and two word utterance level, or any utterances shorter than 10 words, or any utterance you choose to enter? Can the program analyze one, two, or more speakers? What are the maximum length of utterance and the maximum number of utterances this program can analyze? A series of questions concern the flexibility of the program: For example, can the user choose among operations with this program? Can the user supplement the standard analysis types? Are there provisions for user additions to language categories? Does this particular program operate as efficiently as other programs which perform similar operations? Does the

program allow entry of contextual data? Does it allow entry of nonverbal actions? Can the user enter durations for individual speeches, durations for pauses between and/or within speeches, and durations for the total transcript? What does this program do with false starts and repetitions? Do any analyses with machine-graded data put words in incorrect categories? Today one has only a few options for programs to purchase to analyze language samples, but many other packages will follow today's prototypes. Choosing among them will require definition of user demands, the determination of the kind of data set the program will analyze, and specification of the kind of information it produces.

The second very important area to consider in evaluating a program is <u>time</u>. With this program, how much time is required to set up a coding system prior to actual transcript coding? How much time is required to code a transcript prior to entering it into the computer? Can any of these operations be undertaken by a trained clerk rather by than a professional? Will this program allow an analysis to be done in a shorter time than manual analyses? Will it allow more or better analyses to be done in the same amount of time as manual analysis? Answers to some of these questions hinge on the number of transcripts to be analyzed. Whether two or 40 similar

transcripts are to be analyzed may help to determine whether using the computer package is time efficient. For example, taking 20 hours to set up a coding system might make no sense for two transcripts but might be highly worthwhile for 20 transcripts.

The third area to consider is user friendliness. Does this package presuppose user experience with microcomputer operation? If so, how much? Must users know computer languages or be familiar with programs other than this one? How many diskettes must be manipulated? Are the instructions printed on the screen comprehensible without consulting the manual? Does the manual present procedures in a logical manner? Does the manual avoid technical jargon, and when jargon is used, are examples also given to illustrate the meaning? Does the manual have a thorough table of contents section and/or a comprehensive index? How difficult is this program to learn? Does the manual contain a "Getting Started" section for new users? Is there a tutorial disk to introduce the procedures? Does the manual offer examples of the coding system? In our experience, the user friendliness of the package is very important in determining whether it will be used by busy people.

The fourth important area to consider is cost. Does the cost of the program compare favorably with other

programs which can perform similar operations? Based upon a comparison of the personnel demands of analyzing a transcript manually and with this software, is its purchase cost effective? Can additional copies of the program be made for use at different locations of an agency? If additional copies must be purchased, what is the cost for each? Costs of training personnel to use the program should also be calculated here, as well as savings to be accrued if some operations presently being performed by a master's level professional can be taken over by a clerk.

The fifth area to consider in evaluating a software package is local applications. Is local computer hardware adequate for using this program? Do local personnel have time and motivation to learn to use this assessment tool? What kind of training sessions would be needed to initiate use of this package? Would additional personnel need to be hired if this program is widely used? When updated versions of this program become available, can we upgrade our local copy for a nominal fee? Does the publisher have a no obligation examination period? What is the publisher's policy on returns if we find the program to be inappropriate for our situation?

These are some of the most important questions to ask when you are evaluating a software package for analyzing

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language samples. As you can tell, it is essential to match the characteristics of a particular package to your specific local needs. It is also important to look at human factors in your setting to determine whether the package has a good probability of being used.

The first three software packages to become available for language analysis are Lingquest 1, PANEL, and SALT. Other programs are becoming available monthly. The best way to become aware of new programs is to watch for reviews printed in the ASHA journal or other speech-language periodicals. Because of the highly specialized nature of these programs, they are not likely to be reviewed in general microcomputer periodicals.

Lingquest 1, PANEL, and SALT are very different from one another. They are not really competitors, because each has a different purpose and is most likely to be adopted by a different group of users. Because each of the three programs uses a different system for data entry and different coding conventions, a transcript cannot at this time be entered once and then be analyzed by all three programs. It must be coded and entered three different times.

Lingquest 1 was published by Mordecai, Palin, and Palmer in 1982 and is now available from Charles Merrill Publishing Company. At a cost of $695, the purchaser

receives a program disk and a backup, a manual, and a packet of 25 response forms. If a school district or agency wants more copies of the program for use at multiple sites, each additional program disk with backup and manual sells for $125. Each additional package of response forms costs $9.95. Demonstration disks for Lingquest 1 and Lingquest 2 (which analyzes phonology) are available free of charge from the publisher; both Apple and IBM versions are available.

According to the Lingquest manual, "the essential purpose... is to provide a thorough description and analysis of an individual's grammatical usage in a time-efficient manner" (Mordecai, Palin & Palmer, p. 26). Our study group believes that Lingquest 1 meets this objective well.

Here is the procedure for using Lingquest. The clinician or teacher obtains a language sample and prepares a transcript, writing each utterance on an individual line in a form specified in the manual. Fifty utterances can be entered--or more, up to a total of 450 words. Then the clincian expands each utterance to its proper form. For example (point to sample), "him not want to eat now" would be expanded to "he does not want to eat now." Lingquest will identify 81 different grammatical forms, but first the clinician must mark

nouns, certain verbs, gerunds, participles, and particles. Doing this takes only a brief time. The machine will identify all the rest. This machine-grading is probably the most significant time-saver of Lingquest.

For all of the above steps, very specific directions are given in the Lingquest manual. Members of our group had no difficulty following the directions, even those members with little previous computer experience. A few questions arose during the coding process, due largely to the vagaries of the English language. I trust that anyone using Lingquest regularly will develop conventions for dealing with troublesome areas, just as one develops such conventions when doing manual analysis.

Once the transcript has been prepared, expanded, and coded, it can be given to a clerk to enter and run on the computer. In fact, Lingquest's authors, in selling this package to school districts, urged that clerks be hired to free up professionals' time for direct service to clients. Entering a 50 utterance transcript into the computer takes 20 to 25 minutes, and the computer then takes about 15 minutes to perform its analysis and print out the results.

What information does Lingquest provide? First of all, it prints a transcript with actual and expanded utterances and the part of speech for every word. It lists and counts each word used correctly and

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incorrectly. It provides the type-token ratio for the first 50 utterances and also for the entire sample. The heart of Lingquest is a grammatical form analysis which identifies eight grammatical categories comprised of 81 subcategories; for each one, the program conveys the number of opportunities for occurrence within the transcript, the number of correct instances of use, the percentage of correct usage, and the number and types of errors, that is, omissions or substitutions. Lingquest also provides mean length of utterance in words and morphemes. It also offers a structure analysis which sorts according to three phrase structure types, seven basic sentence types, 10 question forms, and 12 complex sentence types; again, we are told the number of opportunities for occurrence, the number of correct instances of use, and the percentage of correct use. Lingquest also analyzes the child's use of verb tenses by identifying the number of opportunities for occurrence, the number of correct instances of use, the percentage of correct usage, and the number of errors evidenced for each of the 12 verb tenses. While all these data are specific and very detailed, Lingquest 1 also provides concise summaries of the client's performance in lexical, formal, structural, and verb tense areas. The printout of this summary is headed by client identification information.

Five files of up to 450 words each can be stored on one floppy diskette.

Lingquest has some limitations. It cannot process words of more than 13 characters or sentences of more than 26 words--limitations that are unlikely to cause concern to those working with young children. It also fails to identify four rather rare types of sentence structure. Here again, it is unlikely that those of us who work with young children will bemoan the fact that Lingquest doesn't identify sentences with doubly embedded clauses! Occasionally, Lingquest indicates "unidentifiable structure" utterances due to diverse reasons. An example from one of my recent transcripts was the the sentence "Benji's at Grandma's and Grandpa's" with the word "house" understood. This was analyzed as an "unidentifiable structure." Fortunately, Lingquest lists in its printout the line numbers of these unanalyzed sentence structures, enabling the program user to go back and evaluate them manually. It is also important for the user to peruse the printed transcript carefully for "machine errors," where a word was put into the wrong category due to atypical usage. It appears that when Lingquest doesn't know what to do with a word, the word is called an adjective. This type of misclassification doesn't happen frequently, but it does happen.

For grammatical analysis in school or clinic and for certain types of research projects, we would endorse Lingquest 1. It is comprehensive, providing the clinician with more information than probably would be obtained manually, and in much less time. However, Lingquest should contribute only one part of a comprehensive language evaluation. There are many important language skills which Lingquest does not aim to evaluate. It will be important for clinicians who adopt Lingquest to continue to use other assessment instruments in order to provide a full profile of a client's linguistic abilities. Lingquest 1 deals only with production, not with comprehension. In expressive language, it can analyze only words, forms, and structures which the setting has allowed the speaker to use; of course, this would be true of any other procedure using a language sample, as well as this one. The Lingquest printout lists the words a client has used and the type-token ratio, but it gives limited information about the size or appropriateness of the client's vocabulary or, indeed, the client's ability to name any specific referents appropriately. In one of my transcripts, a child substituted the word "mixins" for "spoons," with both appropriate and inappropriate forms counted as plural nouns. There is no way to focus on semantic categories or to pick out bizarre or

developmentally immature word choices. Adjustments for regionalisms or dialectical differences need to be made by the coder unless all differences are to be counted as errors; the Lingquest manual provides no rules for such adjustments. (We should say in passing that there is another version of Lingquest, which analyzes one type of Black Dialect. This version is not available from Merrill but must be obtained directly from Dennis Mordecai.) Pragmatics are beyond Lingquest's scope. Because this package analyzes only a single speaker's utterances, it cannot deal with interactive language/discourse skills. Nor can it determine the child's competence in functional uses of language. In summary, while Lingquest 1 meets its objective of effective, efficient grammatical analysis well, this program should constitute only one aspect of any clinical evaluation.

Even with the grammatical analyses that Lingquest performs so well, one is frequently left asking, "What does this finding mean for this particular child?" With Lingquest, as with any other form of language sample analysis, the clinician wishes for more normative data. Lingquest's authors have combed the research literature and have printed in their manual whatever normative data is available for the language behaviors Lingquest evaluates. However, on many questions, normative data is

limited, nonexistent, or very old, and the clinician must fall back upon professional experience alone to evaluate a child's performance. This is a weakness of language sample analysis in general, not of Lingquest alone; the need for more normative data on children's language performance is obvious with every one of the software packages we will talk about today, as well as with manual analysis. Hopefully, the existence of packages such as these will encourage researchers to collect more normative data.

How might Lingquest 1 be used? It should be obvious that this program could be helpful in analyzing the forms of a speaker's utterances. It could be very useful in schools or clinics to show the language structures that children typically use. It may also be used to evaluate an adult's speech to a target child or to a handicapped adult. For example, in an unpublished study Mabel Rice and Patricia Haigh used Lingquest 1 to analyze Mr. Rogers' language to his young television viewers; they then compared Mr. Rogers' data to what has been reported for mothers' language to young children and found great similarities. In another study currently underway, Sally Brandt of the University of Kansas is looking at the language of significant other people to aphasic adults. These early studies suggest to me that Lingquest 1 might

be used to look at the form of teachers' or therapists' language with young children. Perhaps we will come to use Lingquest or programs like it to evaluate our own performance as well as that of the children we serve.

Some other aspects of Lingquest should be briefly mentioned. It is extremely user friendly. The manual is well-organized, clearly written, and presumes no knowledge of computer operations. It even tells the reader when and how to turn on the computer. This should hasten Lingquest's adoption by school systems. One can begin to use this program with success after only a brief period of reading the manual. A drawback for some applications is that Lingquest cannot be adapted to analyze other categories of language; its fixed purpose is what allows directions to be stated exactly and simply for every operation.

The second software package we will discuss today is PANEL. That stands for Productivity Analysis of Early Child Language. PANEL was developed by Dr. Philip S. Dale of the University of Washington. It aims to accomplish two very specific tasks. The program's purpose is "to determine (1) the level of productivity of words and (2) semantic relationships in the young child's language" using a sample of spontaneous utterances. PANEL's analysis is aimed at very immature children, those at

Brown's Stages I and II (Brown, 1973), that is, for children who are just beginning to combine words, for those whose sentences are largely one, two, and three words long. PANEL was not developed as a commercial enterprise but rather as Christmas holiday recreation by Dr. Dale; accordingly, some of the programming expertise of computer software professionals is lacking with PANEL. However, the price is definitely right: Philip Dale provides this program free of charge to those who send him a blank floppy disk and express willingness to experiment with it and provide feedback to him.

The PANEL user obtains a transcript of up to 250 lines from a young child and types in each utterance. For each word combination the user then types in a semantic relation drawn from the system proposed by Dr. David Ingram (1979) of the University of British Columbia and modified by Dale. Morphemes and missing obligatory morphemes are also coded and entered. After data entry is complete, the computer begins its analysis. The analysis takes a long time, reportedly because "linguistic analysis is a matter of string manipulation, rather than numbers, for which BASIC was designed" Dale, 1984, p. 6). Dale suggests--tongue in cheek--that, "This is a good time to have a cup of coffee or lunch or read a good book...." This delay, at least a half hour with the Apple version when the

computer cannot be used for anything else, would be a drawback to the use of PANEL with a large number of transcripts. The IBM version of PANEL takes considerably less time than does the Apple version. Members of our study group entered data directly from a rough transcript; we did not prepare a neat copy of a coded transcript in advance. If that had been done, then data entry could have been performed by a trained clerk.

PANEL provides the following information about the language sample entered. First it puts on the screen or prints a transcript in a standard form, plus for each utterance a line number, the semantic relations entered, and indication of standard or reversed word order. There are nine possible semantic relations, such as agent-action, action-object, and possessor-object. Next it gives information about the types and length of the child's utterances, for example, numbers of intelligible, partially intelligible, and unintelligible utterances; number of imitations and self-repetitions; mean length of utterance in morphemes; mean length of response; range of length of word combinations; number of morpheme types; number of morpheme tokens; and morpheme type-token ratio. PANEL lists the semantic relations used by the child, counts the number of each, and gives a type-token ratio for the nine standard relations. Instructions are given

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for modifying PANEL to include a different set of semantic relations, if the user wishes to do so. The productivity analysis determines whether each word is lexically free and grammatically free within the sample. There are rules for determining this. The goal is to learn whether the child really uses the word in different positions and relationships and with other words, or whether the child is simply repeating a stock phrase, the components of which don't appear in any other combinations. Some researchers have suggested that the maximum of 250 lines which PANEL accepts may mean that a few of the child's words which truly are productive won't be reported as such because the sample is too short. In my opinion, even more restrictive than the 250 line maximum are the limit of 100 different morphemes which PANEL will accept in a given transcript and the limit of 40 instances of any given semantic relation in a transcript. The next set of data PANEL provides deals with the productivity of whole utterances. Finally, PANEL offers a dictionary which lists each word used by the child and the line numbers in which that word appears.

PANEL's purposes are quite focused. Normative data are not available for age of achievement of any given number of semantic relations. Children apparently begin to use the semantic relations in different sequences

(Braine, 1976), so there is no normal developmental progression to which to compare a given child's performance. According to Braine (1976), "Different children acquire formulae in a different order, and thus there are often differences between one child and another early in development due to each child having acquired a different sample from this common core of formulae" (Braine, p. 4). However, with semantic development, generally more is better--the more relations a child uses, the more mature he or she is. Therefore, comparisons of the same child over a period of months or years using PANEL would be more informative than comparisons of a number of different children to one another.

We don't see PANEL becoming widely used in clinics or schools because questions other than productivity and semantic relations are usually given greater importance. We believe that following a single normal, gifted, or handicapped child's semantic development over time would be fascinating, either as a research project or as part of a clinician's effort to gain greater understanding of the language development process.

Our group had some qualms about PANEL in addition to the time it takes to run--for example, the somewhat limited range of semantic relations in the standard

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analysis, some difficulties with the edit mode and the way error messages are reported, and the limited manual (hold it up)--it's only six pages--for users. However, since PANEL is still in the development stage and since it is offered free of charge, we can't criticize it as we might a commercial program. With some minor improvements, PANEL could become one useful tool among the many that are needed to understand young children's language. I think PANEL also illustrates a type of microcomputer program we will see more in the future as communications professionals become more knowledgeable about computer programming: highly specialized tools developed for particular research or clinical purposes.

While Lingquest 1 deals with grammar and PANEL deals with semantics, the strength of the third software package is that it can analyze whatever the user is interested in. The third software package is SALT, which stands for Systematic Analysis of Language Transcripts. SALT (1983) was developed by Dr. Jon Miller and Dr. Robin Chapman of the University of Wisconsin. It is by far the most comprehensive language analysis package available for microcomputers, the most adaptable for varied user needs, the most challenging to learn to run, and the most time-consuming to code before transcript entry..

SALT was developed "to analyze the communicative

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attempts of either one or two speakers during an interaction" (Miller & Chapman, 1983, p. 3). It is the only one of the three packages discussed today which can analyze the performance of more than one speaker. The IBM version of SALT, which is due out this month, will be able to combine multiple speakers before reporting out two sets of results. For example, in an area of considerable interest to us, one could look at classroom interaction with SALT, coding a teacher for one set of analyses and a group of children for the other set of analyses. With SALT, either speaker or group of speakers can be at any stage of language development, from Brown's Stage 1 to mature adult. SALT's greatest merit is its versatility. This package can analyze almost any lexical, grammatical, or discourse form the user chooses to code. Complex analyses of multiple transcripts are not beyond the capability of SALT. Numerous files from one or more clients can be combined and analyzed together as well as separately; if one's computer has a hard disk, a great amount of data can be collated. The new IBM version of SALT supports the use of word processing; that is, the user can create files using Wordstar, Wordperfect, or certain other word processing packages and then have the transcripts analyzed by SALT.

SALT may certainly be a very useful tool for the child

language researcher or clinician. However, the price to be paid for SALT's versatility is user time spent on learning the program, on setting up the coding system, and on coding and entering data.

Let's start by looking at SALT's standard analyses. The program user obtains a language sample--no limits on utterance or file length--and enters it into the computer. The user may include transcript duration; identifying information about speakers, their context, or their nonverbal actions; topic changes; and pause times within or between speaker turns. These data will be printed but not analyzed. Without coding, the standard analyses will provide type/token ratio, mean length of utterance in words, and Brown's language development stage. Distributional summaries note the frequency of occurrence of utterances from one to ten words in length. A feature called Wizzard Word Lists locates, lists, and counts words by type, for example, question words, negatives, conjunctions, modal auxiliaries, semi-auxiliaries, and eight types of pronouns. If these pieces of data are the sole need of the SALT user, then additional coding is not required.

Most users would seek more information. With coding, SALT's standard analyses provide a record of length of turns, distributional summaries of frequency of

utterances of different morpheme length, mean length of utterance in morphemes, and a listing of word roots, their frequency of occurrence, and obligatory-but-omitted bound morphemes.

For these standard analyses the SALT user has many options: screen or printer output, some or all of the analyses, either or both speakers, complete only or all utterances, and intelligible only or all utterances. The menus for these selections are numerous but they are presented in an easy-to-comprehend style.

Most people who use SALT will choose to go beyond the standard analyses. Additional optional procedures provide diverse data. All of them require advance planning and coding by the user. Four types of bracketed flags with unlimited possible internal codes can be inserted into the transcript. Up to 30 number codes can be added to root words or bound morphemes. And slash lines accompanied by letters can be added to make what SALT's authors call "dummy bound morphemes." Each type of insertion is coded and assigned meaning by the user who inserts it, so the possibilities for categories of information to be derived and tabulated by SALT are nearly endless.

SALT has a search procedure which locates specified items the user has coded in bracketed flags. The search also finds "and" pairs--for example, "find all the

utterances which are by child A and which are flagged as containing past tense verbs." "Or" pairs may also be located--for example, "find all the utterances which are flagged as containing a regular or irregular plural." The IBM version's search procedure can also locate items which are adjacent to specified words or morphemes as well as items which appear in a specified order. If bracketed flags are coded before the SALT standard analysis, they will be counted by type in the standard analysis. A better procedure is to insert them with the search procedure; the program will print the whole line containing each instance of the flag along with as many lines before and after the located item as the user wishes.

One more option is very useful. The user can enter lists of words or bound morphemes which SALT will then find in the transcript. One could, for example, ask the program to find a list of vocabulary words which are being taught during therapy sessions to determine whether the child has generalized the use of those words to informal situations in the classroom.

SALT has many helpful features, such as an automatic error finding routine during data entry, an efficient edit mode, and an excellent way of dealing with false starts, repetitions, and tangential comments. As you know, these

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types of utterance can drastically skew MLU figures, and yet it may be important for observers to note how frequently the speaker employs them.

As previously mentioned, there are some costs to be paid for SALT's flexibility of application. First of all, learning to use the program is not a simple endeavor. I had help from knowledgeable users and a tutorial manual and yet I needed 18 hours of preparation to reach a point where I could begin to plan uses for SALT. The 100-page SALT User's Manual is comprehensive, containing procedures for all aspects of the program. It also includes samples of coded transcripts, sample analyses, tables of error messages, flow charts for special operations, and suggestions for entering transcripts of learning disabled and aphasic children. All this information is very helpful to the experienced SALT user, but it is overwhelming to the novice. One wishes the authors had included in their manual brief and simple instructions for beginners for performing basic operations on local data. Ruth Watkins (1985) of the Child Language Program, University of Kansas, has developed such an outline; if you are about to tackle SALT for the first time, you might wish to contact Ruth Watkins and ask for a copy of it. SALT does come with a sample transcript already entered on a disk. Beginners may work with this at first, rather

than operating on their own transcripts. Generally, the manual's vocabulary is appropriate for language clinicians, but a few uncommon terms (for example, "mazes") are included without definition.

A second time-eater for SALT is setting up a coding system. This will be necessary any time users wish more or different information than the standard analyses provide. If SALT is to be useful for particular efforts in either clinic or research settings, user-desired codes will need to be compiled into systems, usually including plotted sequences of insertions and deletions. The extent to which these sequences can be standardized across clients or projects remains to be explored. It appears that due to this required preliminary planning, use of SALT would not be time efficient for one or two transcripts; manual analysis would be faster. However, SALT might be very cost effective for complex analyses of numerous transcripts. The cross-over point from nonefficiency to efficiency depends upon the number of variables to be analyzed and the amount of code planning and code insertion needed.

Coding and entering transcripts takes time in all computerized analyses of language samples. However, with SALT, more than with more limited programs, most information must be coded to be noted. In many cases,

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coding must occur minimally at two different times. An advantage of SALT's minimum of machine-grading is that the computer does not misclassify atypically used words, as happens with some other programs. SALT's coding requires professional skill throughout; very little of it could be delegated to a clerk.

Due to the complexity of the SALT program, it is difficult to foresee this program in wide use in clinical settings until some standardized sequences for data coding become available. At this point, clinical groups who purchase SALT will need to develop their own coding systems according to local needs. We suspect that eventually SALT will become very useful for assessing and monitoring children's language development and also for evaluating the quality and the match of the teacher's or therapist's comments to a given child.

SALT's utility for a given research project will depend upon a number of factors: (1) the number of transcripts to be anlyzed on a given set of variables, (2) the presence or absence of another program with more machine-grading of information to provide the desired data, (3) prior existence of a coding system or budgeted project time to develop one, and (4) the availability of personnel trained to operate SALT or resources to educate such people. SALT may be a tremendous time-saver, or it

may be a time-waster--depending upon the situation.

To date, SALT has been used in three published studies. One study (Nisbet, Zanella & Miller, 1984) compared the language of handicapped adolescents speaking with handicapped and normal peers. Another study with SALT (Miller, Campbell, Chapman & Weismer, 1984) compared the language of aphasic and language disabled 10-year-olds. A third research report (Holland, Miller, Reinmuth, Bartlett, Fromm, Pashek, Stein & Swindei, 1985) monitored an aphasic adult's recovery.

Presently, the first author is developing a coding system to use SALT to analyze young children's recall of stories and their telling of original stories. Because I will have many transcripts to deal with, I believe that SALT will save time in my analysis and tabulation. It will also make my data available in an attractive and readable format.

The IBM version of SALT will be compatible with the new computerized child language data bank at Carnegie-Mellon University in Pittsburgh. This repository for transcripts will include most of the historic transcripts which have advanced child language studies. Roger Brown's Adam, Eve, and Sarah will be there, along with Melissa Bowerman's Eva and Christy, Lois Bloom's Eric, Gia, Kathryn, and Peter,and many many others. New transcripts will

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be added as they become available. The new child language data bank will be a treasure of data for language researchers, and so it is fortunate that the new version of SALT will be compatible with it.

Robin Chapman, one of Salt's authors, told us recently that she is experimenting with using SALT as a teaching tool in classes on normal and atypical language development. She is using longitudinal sets of several children's language samples along with the accompanying SALT analyses to teach undergraduate and graduate students about children's language development.

Purchasers of SALT receive a program diskette and backup. Additional copies of the program disk may be purchased by the same agency at a cost of $125 for each two additional copies.

We have talked today about three language analysis programs, each very different in purpose and function from the others. Each of the programs we have discussed today--Lingquest 1, PANEL, and SALT--has a definite strength which the others do not have. Each would be very cost efficient in certain situations but not in others. Each would satisfy some users' needs but not others. We have seen today that the place to begin in purchasing a software package is in evaluating your own needs. Determining whether to buy one of these packages means

evaluating whether the strength of the package would make a difference in your setting with the type of questions you are are trying to answer.

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